AMENDMENTS TO THE CLAIMS

1. (currently amended) A method ~~to disaggregate~~ comprising disaggregating asphaltenes in a petroleum oils and ~~oil~~ mixtures of petroleum oils, feedstream and/or refinery process streams ~~comprising~~ by mild heating of said petroleum oils and mixtures of petroleum oils, feedstream and/or refinery process streams, the disaggregated asphaltenes remaining soluble in the petroleum oil and mixtures of petroleum oils feedstream and/or refinery process streams.

2. (currently amended) The method of claim 1 further comprising the step of determining the presence of asphaltene aggregates by irradiating said petroleum oils and ~~oil~~ mixtures of petroleum oils, feedstream and/or refinery process streams with neutrons and determining small angle neutron scattering (SANS) intensity, I, as a function of wavenumber, q, wherein said scattering intensity includes a coherent component and an incoherent component.

3. (currently amended) The method of claim 2 wherein said neutron scattering wavenumber, q, is in the range 10^{-4} Å^{-1} $\leq q \leq 1$ Å^{-1}~~, preferably 10^{-3} Å^{-1} $\leq q \leq 10^{-1}$ Å^{-1}~~.

4. (currently amended) ~~A~~ The method of claim 3 wherein ~~to determine~~ the ~~regimes of~~ compatibility and incompatibility of petroleum oils and mixtures of petroleum oils and/or refinery process streams are determined ~~using~~ fitting ~~of~~ $I(q)$ ~~in claim 2~~ to an equation based on a physical model that contains coherent components, ~~contributions~~ a strongly decaying component ~~feature~~ to describe the surface scattering of asphaltene aggregates at the ~~low~~ q~~,~~ near its lower range (low-q), a plateau ~~feature~~ component with a rolloff for ~~at higher~~ q near its upper range (high-q) to describe the asphaltene particles, and a constant to describe the ~~high~~ q incoherent ~~scattering~~ component.

5. (currently amended) The method of claim 4 wherein the equation is given by ~~Equation (1).~~

$$\underline{I(q) = I_{\text{incoh}} + I_{\text{L}} / \left(1 + q^2 \xi^2\right) + I_{\text{surf}} \left(q / q_1\right)^{-\alpha}}$$

wherein, I_{incoh} is the constant high-q incoherent scattered neutron intensity, I_L is the low-q plateau intensity of the Lorentzian (second term), ξ is the correlation length (proportional to the radius of gyration of an asphaltene particle), I_{surf} is the low-q value of the intensity due to surface scattering from asphaltene aggregates, α is the absolute value of the logarithmic slope of $I(q)$ at low q, and q_1 is fixed by the lowest q in the range.

6. (currently amended) The method of claim 5 wherein ~~the criterion for~~ incompatibility is determined by the concavity of the low-q plateau intensity of the asphaltene particles, I_L, as a function of the volume fraction of mixing, ϕ_m.

7. (currently amended) The method of claim 5 wherein ~~the criterion for~~ incompatibility is determined by the systematic deviation of I_L, as a function of mixing volume fraction from ~~the~~ a hard sphere prediction ~~given by Equation (2)~~.

8. (currently amended) The method of claim 5 wherein ~~the criterion for~~ incompatibility is determined by ~~the~~ a maximum in the correlation length, ξ ~~given by Equation (2)~~.

9. (currently amended) The method of claim 5 wherein ~~the criterion for~~ incompatibility is determined by the dominance of the low-q value of the surface

scattering intensity, I_{surf}, over the sum of the low-q plateau intensity of the asphaltene particles, I_L, and the incoherent scattering intensity, I_{incoh}.

10. (currently amended) The method of claim 5 wherein ~~the criterion for~~ incompatibility is determined by the power law exponent, α, exceeding a value of three.

11. (currently amended) A method to estimate the volume fraction of asphaltene aggregates, ϕ_{agg}, in incompatible petroleum oil and/or refinery process stream mixtures ~~based on~~ comprising determining the ~~a~~ difference between I_L, the low-q plateau intensity corresponding to the asphaltene particles, ~~I_L, determined in claim 5 at different volume fractions of mixing, ϕ_m,~~ and ~~a prediction for the behavior of this~~ I_{HS}, the intensity ~~expected~~ for ~~spherical particles interacting by contact repulsions~~ perfect hard spheres in the absence of aggregation, wherein I_L, and I_{HS} are determined at different volume fractions of mixing ϕ_m.

12. (currently amended) The method of claim 11 wherein the equation to estimate the volume fraction of asphaltene aggregates, ϕ_{agg}, is given by ~~Equations (2) and (3)~~ the difference between the measured valve of I_L (ϕ_m) and the IL (ϕ_m) for perfect hard spheres in the absence of aggregation.

13. (currently amended) The method of claim ~~2~~ 5 wherein the total surface area of asphaltene aggregates per unit volume of the petroleum oil, S_V, is determined from the ~~amplitude of the~~ surface scattering intensity, I_{surf}, ~~from asphaltene aggregates~~ at low wavenumbers, q.

14. (currently amended) The method of claims 12 ~~and 13~~ wherein the average length scale, R, associated with the internal structures of the asphaltene

aggregates is ~~estimated using Equation (4)~~ determined from the ratio of the volume fraction of asphaltene aggregates and the total surface area of asphaltene aggregates, wherein the total surface of asphaltene aggregates per unit volume of the petroleum oil, S_V, is determined from the surface scattering intensity, I_{surf} at low wavenumbers, q.

15. (New) The method of claim 2 wherein said neutron scattering wavenumber, q, is in the range 10^{-3} Å$^{-1} \leq q \leq 10^{-1}$ Å^{-1}.

16. (New) The method of claim 1 wherein said heating is performed at a temperature between 40°C and 150°C for a time period of 1 minute to four weeks.

17. (New) The method of claim 1 wherein said heating is performed at a temperature range between 40°C and 100°C for a time period of 2 minutes to 24 hours.

18. (New) The method of claim 1 wherein said heating is performed at a temperature range between 40°C and 80°C for a time period of 3 minutes to 3 hours.

19. (New) The method of claim 1 wherein said heating is performed at a temperature range between 40°C and 60°C for a time period of 4 minutes to 1 hour.